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Modeling of filamentation damage induced in silica by 351-nm laser pulses.

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Lasers for inertial confinement fusion studies at Lawrence Livermore National Laboratory are designed through use of computer codes that model the propagation of a beam through the components in a proposed laser. These codes treat, at various levels of sophistication, the effects of linear diffraction, loss, amplification, self-focusing and harmonic conversion. Subsections of these codes have been compared with experimental results. This paper describes comparison of calculations by one of the codes, PROP2, with results of 351-nm self-focusing experiments. In those experiments, a silica rod with length of 20 cm was placed in a beam with diameter of 22 mm, and the intensity was sequentially increased during a series of shots until filamentation damage was induced in the silica sample. The inputs to the code were the intensity distribution in the 351-nm beam, the peak intensity, the thicknesses and spacing of components in the beam line, and a value of the self-focusing coefficient which was obtained by reviewing the literature, $3.55 \pm 0.55 \times 10^{-16}$ cm^2/W. The code predicted a steeply rising intensity at a position in the silica rod that closely agreed with the location of the upstream limit of the self-focusing tracks.

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